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# THE NATIONAL VERIFICATION SCORE ARCHIVE

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## 1. INTRODUCTION

In October 1983 the National Weather Service (NWS) implemented an automated system for collecting locally issued official forecasts, Model Output Statistics (MOS) guidance (Glahn and Lowry, 1972), and verifying observations for numerous weather elements. These data are collected at 47 Weather Service Forecast Offices (WSFO's), transmitted via the Automation of Field Operations and Services (AFOS) system to the National Meteorological Center (NMC), and permanently archived on magnetic tape at NMC's central computer facility. Ruth and Alex (1987) describe the collation of data at each WSFO and the transmission of these data to the NMC computer. Verification scores are computed on a routine basis for the 6-mo seasons of April-September and October-March. Summary reports are provided at the national, regional, and local levels. The warm season 1987 scores are discussed in Dagostaro et al. (1988). An overview of the AFOS-era Verification (AEV) data processing system is provided in Dagostaro (1985).

Since 1966, the NWS has verified temperature and precipitation forecasts on a routine basis. The original verification program was replaced by the highly-automated AEV system in 1983. An official long-term record of forecasts and observations was established by using a subset of the early verification data along with the more recent data. A study of trends in the temperature and precipitation scores over the 20-yr period beginning in April 1966, as well as a brief history of the pre-AEV system, is given in Carter and Polger (1986).

The verification scores that are evaluated are defined in the NWS National Verification Plan (National Weather Service, 1982). Scores for each 6-mo season are maintained in a permanent archive for the following purposes: to assess the long-term trends in various scores, to provide the research community with the scores, and to maintain a permanent record of the scores for future use. In this document, the permanent archive of the forecasts and observations will be referred to as the data archive, and that of the verification scores will be referred to as the score archive. The score archive actually consists of two distinct data sets: one set covers the period from April 1966 to the present and is referred to as the long-term score archive; the second covers the period from October 1983 to the present and is termed the AEV score archive.

## 2. STATIONS

### A. Long Term

The 100 stations listed in Table 1 comprise the long-term data and score archives. The verification sites were chosen so that spatial coverage remained relatively constant over the entire period of record. Since the stations which participated in the program changed over the years, data are available for about 80 stations in any given year. See Carter and Polger (1986) for further details.

## B. AFOS-era

Here, the data and score archives are for the 94 stations listed in Table 2. Each of the 47 WSFO's in the conterminous United States transmits data to NMC for itself and a Weather Service Office (WSO) within the WSFO's area of responsibility.

Although the WSFO's remain constant throughout the period of record, the WSO's may change. For example, Philadelphia, Pennsylvania transmitted data for itself and Atlantic City, New Jersey during the first two seasons of the AEV system. However, Atlantic City was replaced by Scranton, Pennsylvania in October 1984. These type of changes are summarized in Table 3.

# 3. WEATHER ELEMENTS

The long-term score archive is comprised of verification scores for maximum/minimum (max/min) temperature and probability of precipitation (PoP) forecasts. The weather elements for which scores have been calculated since October 1983 are max/min temperature, PoP, probability of precipitation type (PoPT), snow amount, surface wind speed and direction, cloud amount, ceiling height, and visibility. Scores are calculated for a matched sample of local and MOS forecasts, and the verifying observations, unless otherwise noted. Details for each weather element are summarized as follows:

Max/Min Temperature - The local forecasts are valid for daytime/nighttime periods. Originally, the MOS forecasts were valid for calendar day periods (Dallavalle et al., 1980). On November 25, 1985, these calendar day guidance forecasts were replaced by max/min temperature forecasts valid for daytime/nighttime periods which closely approximate those of the local forecasts (Erickson and Dallavalle, 1986). Two types of observations are transmitted by the stations to NMC and stored in the data archive. The first is a calendar day max (min) reported at 1200 (0600) GMT, while the second is a daytime max (nighttime min). Verification scores were calculated using only the daytime max/nighttime min observations. Although the MOS forecasts were not valid for daytime/nighttime periods prior to November 25, 1985, those observations were used since they correspond more closely to the local forecast.

PoP - The local and MOS forecasts, as well as the precipitation amount observations, are valid for 12-h periods. MOS forecasts have values of 0.0, 0.02, 0.05, 0.10, 0.20, ...1.00, while the local forecasts may be any of those values except 0.02. The verifying observation is the occurrence of .01 inches or more of precipitation for a 12-h period. For the 0000 (1200) GMT cycle, the 12-h amount is the sum of two 6-h amounts reported at 1800 and 0000 GMT (0600 and 1200 GMT).

Precipitation Type - The local and MOS forecasts are categorical forecasts as follows:

1 = freezing (ZL, ZR)
2 = frozen (IC, IP, IPW, S, SG, SP, SW), and
3 = liquid (L, R, RW).

Both types of forecasts are conditional on occurrence of precipitation. Two types of observations were used to verify these forecasts. The first was the observed type(s) at the verifying hour, and the second was the observed type(s) reported in routine and special observations for a 2-h window ($\pm$ 1 hour) about the verifying hour. Verification scores that were calculated by using the observation at the verifying hour are distinguished from those based on the observation for the 2-h window by an identification number in the score archive. Since more than one form of precipitation can occur simultaneously, observations of mixed precipitation are placed in categories according to the most hazardous precipitation type. For example, mixed frozen and liquid precipitation is placed in the frozen category, and the occurrence of freezing rain in combination with any other type of precipitation is considered freezing rain.

Snow Amount - The local forecast is valid for the 12-h period ending at 0000 or 1200 GMT. The observed snow amount for the 0000 (1200) GMT cycle is the sum of the 6-h amounts reported at 1800 and 0000 GMT (0600 and 1200 GMT). The MOS guidance is a categorical forecast as follows:

0 = $\leq$ 1 inch,
2 = 2-3 inches,
4 = 4-5 inches, and
6 = $\geq$ 6 inches.

Wind Speed - The local and MOS forecasts and verifying observations are in whole knots. The forecasts and observations are placed in the following categories for the 12-, 18-, and 24-h projections:

1 = $\leq$ 12 kt,
2 = 13-17 kt,
3 = 18-22 kt,
4 = 23-27 kt,
5 = 28-32 kt, and
6 = $\geq$ 33 kt.

The 42-h forecasts are simply a yes/no forecast of the occurrence of wind speed > 22 kt. The forecasts and observations are placed in the following categories:

1 = $\leq$ 22 kt, and
2 = > 22 kt.

Two types of observations are used to verify the wind speed forecasts. The first is the observation taken at the verifying time, and the second is the highest 1-min average wind speed in a 6-h window ($\pm$ 3 hours) about the verifying time. The scores that have been calculated using the observation at the verifying hour are distinguished from those using the observation in the 6-h window by an identification number in the score archive.

Wind Direction - Wind direction is both reported and observed to the nearest 10 degrees. Both the local and MOS forecasts are verified with the observation at the verifying hour only. Both types of forecasts and the verifying observation are placed into the following categories:

1 = 340-20 degrees,
2 = 30-60 degrees,
3 = 70-110 degrees,

4 = 120-150 degrees,
5 = 160-200 degrees,
6 = 210-240 degrees,
7 = 250-290 degrees, and
8 = 300-330 degrees.

Cloud Amount - The local forecasts, MOS guidance, and observations are expressed in categories. The categories are defined as follows:

1 = CLR, -X, -SCT, -BKN, -OVC,
2 = SCT,
3 = BKN, and
4 = OVC, X.

Ceiling height - The local forecasts, observed ceiling height, and "persistence forecasts" are placed in categories that correspond to the MOS categorical forecasts. The categories are defined as:

1 = 0-100 ft,
2 = 200-400 ft,
3 = 500-900 ft,
4 = 1000-2900 ft,
5 = 3000-7500 ft, and
6 = > 7500 ft.

Visibility - The local forecast, observed visibility, and persistence forecast are converted to categorical values which correspond to the MOS categorical forecasts. The categories are defined as follows:

1 = < 1/2 mi,
2 = 1/2 - 7/8 mi,
3 = 1 - 2 3/4 mi,
4 = 3 - 4 mi,
5 = 5 - 6 mi, and
6 = > 6 mi.

Prior to the cool season of 1986-87, the local and guidance forecasts for the aviation elements of ceiling height, visibility, and wind speed and direction were valid at the same projections, and a comparative verification was performed on a matching sample of data. The local and MOS aviation forecasts were verified against the observations collected at the station and transmitted to NMC. The persistence forecasts, which were defined as the 0900 (2100) GMT observation for the 0000 (1200) GMT cycle, were also collected at the station and transmitted to NMC. For ceiling and visibility, a comparative verification was performed on a matching sample of local, MOS, and persistence forecasts.

In December 1986, the release time of the official aviation terminal (FT) forecasts changed. The local forecasts for all stations are no longer released at the same time each day, such as 0930 GMT. The forecasts are now released at nearly the same local time. Thus, the forecasts associated with the 0000 GMT cycle are released at 0830 GMT for stations in the Eastern Time Zone (when standard time is in effect), while the forecasts associated with the 0000 GMT cycle are released at 1030 GMT for stations in the Pacific Time Zone. With the change in issuance time of the FT's, the local and MOS forecasts are no longer valid for the same periods, so a comparative verification is no longer possible. The local aviation forecasts are verified against the observations collected at the station and transmitted to NMC. A comparative verification of local and persistence forecasts is performed for ceiling and visibility using persistence forecasts collected at the station and transmitted to NMC. The observations used as the persistence forecasts and the verifying observations are now based on the local time rather than the cycle (Ruth and Alex, 1987.)

The valid time of the MOS aviation forecasts has not changed. The MOS forecasts are now verified against observations taken from hourly reports collected at NMC. A comparative verification of MOS and persistence forecasts is performed for ceiling and visibility using persistence forecasts taken from hourly reports. In this case, the persistence forecast is still defined as the 0900 (2100) GMT observation for the 0000 (1200) GMT cycle. (Note that the wind speed forecasts for the 42-h projection were not affected by the change in the FT issuance time, so a comparative verification of the local and MOS forecasts is still performed for that projection.)

## 4. ARCHIVE PROCEDURES

The procedure to write the verification scores to the score archive is the same for both the long-term and AEV score archives. The forecasts are verified and the scores written to an intermediate data set for further processing as described in Appendix I. The scores are then used as input to a program that writes the permanent score archive on magnetic tape. Appendix II gives further details about this procedure. Both of these steps make use of the Statistical Analysis System (SAS Institute, 1985). Appendix III shows the format of the archive tapes. Each file on the long-term archive tape contains max/min temperature and PoP scores for a 6-mo season. The archive begins with the warm season of 1966 and continues to the present. Each file on the AEV score archive tape contains scores for the weather elements described in Section 3 of this document. The AEV archive begins with the 1983-84 cool season and continues to the present. At the end of each 6-mo season, the new scores are added to the archive as a separate file. The scores that are saved for each element are shown in Table 4. Descriptions of the score identification numbers are given in Appendix III.

## 5. ACCESSING THE ARCHIVED SCORES

Currently, a general purpose computer program is being prepared to retrieve the scores for various stations and elements. This software will retrieve scores for any given set of stations, weather elements, and projections. Documentation of the program will also be provided.

## 6. ACKNOWLEDGMENTS

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## APPENDIX I

### Calculation of Scores

The calculation of scores is described in detail in Dagostaro (1985); however, part of this procedure will be discussed briefly here. The entire process consists of three steps. First, the desired forecast and observed data are retrieved from the archive. Next, the data are restructured into a format that the verification modules can use. Each weather element is verified separately except for max/min temperature and PoP. Finally, the scores are calculated. The last step also contains an option to write the scores to an intermediate data file for further processing. When executing the program for the purpose of archiving the scores, this option is used.

An example of the Job Control Language (JCL) to run the program that calculates scores for max/min temperature and PoP is shown in Fig. 1. The score calculation step makes use of the Statistical Analysis System (SAS) (SAS Institute, 1985). In order to execute the verification code, several variables must be initialized. The variables are: the first and last dates of the desired verification period; an indicator which determines the types of forecasts to compare; the projections of the forecasts; a code number which indicates the destination of the verification reports; and a code number which indicates whether the final scores are to be saved for further processing. The software is structured so that a single SAS statement both initializes the variables and invokes the macro. The following is an example of a SAS statement used to execute the verification program for max/min temperature and PoP:

```
%VERFTMPC(861001,870331,1,1,24,36,48,60,FT20F001,TP868700)
```

Here, the verification period is October 1, 1986-March 31, 1987; a comparative verification of the local and MOS forecasts is to be performed; the projections are 24, 36, 48, and 60 hours; the summary scores are written to an output data set; and the scores are saved for further processing in a SAS data set named TP868700. Any unique name may be used for the latter data set. If the option to save the scores is not desired, "NA" must be used in place of a data set name. For the example in Fig. 1, the JCL statement which defines the data set is:

```
//SCORARCH DD DSN=$WE21VD.ALLSCORS.CL8687,DISP=(NEW,CATLG),
//    UNIT=TSODA,SPACE=(TRK,250)
```

The Data Control Block (DCB) variables should not be explicitly defined in this statement, since SAS automatically defines them. The SAS data set named TP868700, which contains the max/min temperature and PoP scores, is saved in the SAS data library named $WE21VD.ALLSCORS.CL8687. Each subsequent run of a verification module adds a new data set to the data library if the option to do so is invoked. The data sets created by the verification modules are only usable by SAS (i.e., they are not in a form which other programming languages can access).

## APPENDIX II

### Archiving of Scores

The score archive program, which also makes use of SAS, writes the scores to the permanent archive. The archive program is stored in 'NWS.WE21.VJD. SOURCE(SCORARCH)'. The job requires three data sets as input. The first is a user defined data set that lists the stations for which verification scores are desired. The SAS program reads the data from an on-line disk data set in card image form. The station list consists of three items of information per station: the station WBAN number, the first letter of the NWS Administrative region in which the station is located, and the station call letters. Any number of stations, up to six, may appear on a "card". Fig. 2 describes the format of the station list data set. The DDNAME of this data set must be INSTA. The first time the archive job is run, the desired stations on the input list are written to the header records of the score archive. In subsequent runs of the archive program, the stations are read from the header records, thus the data set containing the station list is not used in later runs and the DD card can be omitted from the JCL. Since the national and regional scores are valid for a specific list of stations, it is important that the stations in the header records match those for which the scores were calculated. If the stations do not match, a message is written to the SAS printed output file (FT12F001).

The second input data set, whose DDNAME is SCORARCH, is the SAS data library that contains the verification scores. This data library was created during a previous run of the SAS verification module. The third required data set is a SAS format library. The user need only to include a DD card in the JCL which describes the library. The DDNAME associated with the format library is SASLIB, and the data set name is 'NWS.WE21.VJD.SASFMT'.

Like the verification modules, the archive program is run separately for each cycle and weather element. For the aviation elements, the program is also run separately for the local and MOS scores. Fig. 3 shows the JCL to archive the max/min temperature and PoP scores for the 0000 GMT cycle for the 1986-87 cool season. The SAS statement which initializes the variables and invokes the macro is:

```
%SCORS(861001,870331,Y,N,Y,DAYNITXN,NA,TP868700).
```

Eight variables are required.

Variable 1 - first date of verification period in the form YR*10000 + MO*100 + DAY.

Variable 2 - last date of verification period in the same form as above.

Variable 3 - code to determine if header records are to be written to output data set; value is Y or N. If Y is used, a DD card describing the data set which contains the station list must be included in the JCL. The DDNAME is INSTA.

Variable 4 - code to determine if dummy record is to be written to output, value is Y or N. A dummy record is written to signal the end of the data set.

Variable 5 - code to determine if job should terminate if verification scores do not exist for all desired stations; value is Y or N. If a value of Y is used and stations in the input data set or archive header records do not match stations for which scores are available, the job ends without writing scores to the output file. If a value of N is used and the station lists do not match, missing values (9999.) are written to the score archive for those stations for which scores are not available. Care should be exercised if the option to terminate the job is not chosen (i.e., if a value of N is used), since the regional and national scores may be rendered invalid by a different station list. A message is written to the SAS output file (FT12F001) indicating which stations do not match.

Variable 6 - code which determines what type of scores are to be written to output. Possible values are:

DAYNITXN = max/min temperature scores calculated with the daytime/nighttime observation as the verifying observation,
CALNDRXN = max/min temperature scores calculated with the calendar day observation as the verifying observation
POP = PoP scores
CLD = cloud amount scores
CIG = ceiling height scores
VIS = visibility scores
MWSP = wind speed scores using the highest sustained wind in a 6-h window as the verifying observation
WSPD = wind speed scores using the observation at the verifying hour
WDIR = wind direction scores (scores are always calculated using the observation at the verifying hour)
PPTV = precipitation type scores using the observation(s) at the verifying hour
POPT = precipitation type scores using the observation(s) in a 2-h window about the verifying hour
POSA = snow amount scores
NA = no scores written, used if just header or trailer records are written

Variable 7 - code which indicates the type of forecast for which scores are to be archived. Possible values for the aviation elements are LCL, MOS, or NA. A value of NA indicates that both local and MOS verification scores, along with the persistence scores for the ceiling and visibility, are to be written to the output file. The value of NA should be used only if scores have been calculated on a matched sample of local and MOS forecasts (i.e., scores calculated for seasons prior to the cool season 1986-87). A value of LCL (MOS) is used if only local (MOS) and the corresponding persistence scores are to be archived. Use of any other values for this variable will result in abnormal job termination when archiving aviation element scores. When archiving scores for the public weather elements (max/min temperature, PoP, cloud amount, precipitation type, and snow amount), this variable is not used. For public weather elements, both the local and MOS verification scores are always written to the score archive.

Variable 8 - name of data set containing verification scores for this weather element. The data set name was defined when the verification module was run and the scores written to the SAS data library.

Based on the example shown in Fig. 3, header records are to be written to the score archive, as well as the max/min temperature scores for all projections from the 0000 GMT cycle. None of the variables explicitly indicates the cycle to process; the user is responsible for providing the correct data. Usually the cycle will be obvious from the SAS data set name that was used when the scores were saved in the SAS data library. Here the observation used to verify the forecasts is the daytime/nighttime observation. The code DAYNITXN indicates that the scores are to be written with specific identification numbers in the score archive data records.

Each subsequent run of the archive program reads the stations from the header records. For this reason, it is useful to temporarily write the score archive to a disk. This eliminates excessive rewinding of the tape if more than one run of the archive program is made in one job. The archive program is run separately for each element and cycle, but several runs of the program may be contained in one job. The JCL to archive the scores for all remaining elements for the 1986-87 cool season is shown in Fig. 4. Note that each time the SAS macro is invoked, the variables are redefined. The last time the macro is invoked, a dummy record is written as the last record of the file.

The verification scores are written to an output data set with the DDNAME of FT21F001. The data set may be written to disk until scores for all elements have been archived, and then copied to magnetic tape. The permanent archive resides on a 6250 bpi density tape, with DCB variables: LRECL=860, BLKSIZE=23224, and RECFM=VBS. Each file on the tape contains the scores for a 6-mo season. The data set name of each file is OVER. The format of the tape is described in Appendix III.

## APPENDIX III

### Format of NWS Verification Score Archives

A - One file of data pertaining to one season of verification data and consisting of:

1 - Header information:

Record 1 - 10 words:

Word 1 - 4 characters = 'OVER' used to identify the NWS Official Verification data. (A4)

Word 2 - Number of stations for which scores exist for this season = NSTA. (Integer*4)

Word 3 - Number of groups for which scores exist for this season = NGP. (Integer*4)

Word 4 - Number of stations and groups for which scores exist for this season = NSG = NSTA + NGP. (Integer*4)

Word 5 - Number of 4-byte words in header records following this one = NHDR = NSG + 4. (Integer*4)

Word 6 - Number of 4-byte words in data records following NGP + 8 header records = NWDS = 2*NSG + 4. (Integer*4)

Word 7 - Beginning date of season in format YR*10000 + MO*100 + DA. (Integer*4)

Word 8 - Ending date of season in same format as word 6. (Integer*4)

Words 9-10 - Zero (not used). (Integer*4)

Record 2 - NHDR Words (Integer*4):

Word 1 - Zero (not used).

Word 2 - Record ID = 1.

Word 3 - Zero (not used).

Word 4 - Zero (not used).

Words 5-NHDR - NSG station WBAN and group numbers. Summaries for groups of stations (e.g., NWS regions, overall, etc.) are assigned an ID. The NWS Region numbers are ER = 101, SR = 102, CR = 103, WR = 104, AR = 105, and PR = 106. The 48-state summary = 200.

Record 3 - NHDR words:

Word 1 - Zero (not used).

Word 2 - Record ID = 2. (Integer*4)

Word 3 - Zero (not used).

Word 4 - Zero (not used).

Words 5-NHDR - NSG station call letters in same order as in record 2. Groups of stations have special labels assigned. NWS Regions are 'ER  ', 'SR  ', 'CR  ', 'WR  ', 'AR  ', and 'PR  '. The 48-state summary is labeled 'US48'. (A4)

Records 4-8 - NHDR words:

Word 1 - Zero (not used).

Word 2 - Record ID = 3 through 7. (Integer*4)

Word 3 - Zero (not used).

Word 4 - Zero (not used).

Words 5-NHDR - NSG station names in same order as in record 2. Each record contains 4 characters of name. NWS regions are 'EASTERN REGION      ', etc. The 48-state summary is labeled '48 STATES           '. (A4)

Records 9-NSG + 8 - NHDR words (Integer*4):

Word 1 - Zero (not used).

Word 2 - Record ID = 8 through NGP + 8 (see record 1, word 3).

Word 3 - Number of stations in summary identified by this record = KSTA.

Word 4 - Summary number of summary identified by this record. For instance, Eastern Region summary = 101. These will be in the same order as they appear in record 2, word 5 and following (e.g., this word 4 in record 9 will be the same as word NSG - NGP + 1 in record 2).

Words 5-NHDR - The first KSTA words contain the WBAN numbers of the stations involved in the summary whose identifier is in word 4. The remainder of the words are zero.

2 - Multiple records of size NWDS words (words 1-4 are Integer*4), consisting of:

Word 1 - Approximate release time of forecast in GMT. The following definitions apply:

| | |
|---|---|
| Official early morning public | - 0900 |
| Official early morning public update | - 1400 |
| Official early evening public | - 2100 |
| Official early morning FT | - 0900 |
| Official late morning FT | - 1400 |
| Official early evening FT | - 2100 |
| MOS guidance, 0000 GMT cycle | - 0300 |
| MOS guidance, 1200 GMT cycle | - 1500 |

Word 2 - Score ID. The following definitions apply (note: sample size is size of total sample unless otherwise indicated):

10 = Brier Score (BS).
11 = BS when LCL PoP $\geq$ 30% (sample size = number of times LCL PoP $\geq$ 30%).
12 = BS when precipitation occurred (sample size = number of precipitation cases).
20 = Mean Absolute Error (MAE).
21 = MAE when 24-h temperature variability $\geq$ 10°F (sample size = number of observed temperature changes $\geq$ 10°F).
22XX = Number of temperature forecasts whose absolute error falls into category XX, where XX is defined in Table 5.
30 = Mean Square Error (MSE).
31 = Root Mean Square Error (RMSE).
40 = Mean Algebraic Error (bias).
50 = Percent Correct.
60 = Log Score.
70 = Heidke Skill Score.
80 = Probability of Detection (POD - 32°F) (sample size = number of times min temperature observation was $\leq$ 32°F and previous day's min temperature observation was $\geq$ 40°F). This score is calculated only for minimum temperature.
80XX = POD for category XX, where XX is defined in Table 5.
81 = False Alarm Ratio (FAR - 32°F) (sample size = number of times min temperature forecast was $\leq$ 32°F and previous day's min temperature forecast was $\geq$ 40°F). This score is calculated only for minimum temperature.
81XX = FAR for category XX, where XX is defined in Table 5.
82 = Threat Score (TS).
82XX = TS for category XX, where XX is defined in Table 5.
83 = POD for the lowest two categories combined (i.e., LIFR and IFR). This score is calculated only for ceiling height and visibility.
84 = FAR for the lowest two categories combined (i.e., LIFR and IFR) for ceiling height and visibility.
85 = TS for the lowest two categories combined (i.e., LIFR and IFR) for ceiling height and visibility.

90 = Mean.
91 = Variance.
92 = Standard deviation.
1XX = Frequency of event for category XX. This is either the number of forecasts or the number of observations of a category, depending on the weather element and forecast source code used. This can apply to a category of ceiling height, say, defined as the observations of 200-400 ft, or to a category of PoP defined as forecasts of a particular (rounded) value such as 40%. A value of 9999. indicates that there were no cases for that category.
2XX = Bias of event for category XX (see 1XX above), defined as number of forecasts of event divided by number of observations of event. If number of observations = 0, this score is set to 9999. If number of forecasts = 0, this score is set to 8888.
3XX = Reliability for category XX, defined as the relative frequency of the event compared with the average forecast, either overall or stratified by intervals. For PoP, a value of 0 indicates that the category was forecast, but the observed value was not a precipitation case, and a value of 9999. means that there were no forecasts for that category.

Word 3 - Forecast projection in hours. This is measured from the forecast release time for both official forecasts and guidance as specified by word 1. For forecasts spanning a period (e.g., 12-h PoP), the projection will be the ending hour. For example, the official "first period" 12-h PoP issued at 0900 GMT would have word 3 = 15 and the corresponding guidance word 3 = 21.

Word 4 - Weather element and forecast source (i.e., official, guidance, climatology, or persistence) identifier. Some scores, such as variance, pertain only to one variable, like the verifying observations. Definitions of the code numbers are given in Table 6.

Words 5 - NWDS - NSG pairs of words contain the scores and corresponding sample sizes for stations and group summaries identified in record 2. (score - Real*4, sample size - Integer*4)

3 - A dummy record consisting of:
Words 1 - NWDS - Set = 9999.

B - End of data on tape signaled by an EOF.

COMMENTS: This format allows for flexibility of changing any of the parameters defining the verification scores at any time. Fig. 5 shows the format of the archive tapes.

I/O MODE: These are 9 track tapes (6250 bpi density) with a SAS output statement that is equivalent to the unformatted FORTRAN WRITE statement, and with the DD statement:

```
//GO.FT21F001 DD DSN=OVER,DISP=(NEW,KEEP),LABEL=(N,SL),
  UNIT=T6250,VOL=SER=EXXXXX,
  DCB=(RECFM=VBS,LRECL=860,BLKSIZE=23224)
```

Table 1. One-hundred stations for which scores are saved in the long-term archive.

| | | | |
|---|---|---|---|
| ABI | Abilene, Texas | ILM | Wilmington, North Carolina |
| ABQ | Albuquerque, New Mexico | IND | Indianapolis, Indiana |
| ALB | Albany, New York | INL | International Falls, Minnesota |
| ALO | Waterloo, Iowa | ISN | Williston, North Dakota |
| AMA | Amarillo, Texas | JAN | Jackson, Mississippi |
| ATL | Atlanta, Georgia | LAS | Las Vegas, Nevada |
| AVL | Asheville, North Carolina | LAX | Los Angeles, California |
| BDL | Hartford, Connecticut | LBB | Lubbock, Texas |
| BHM | Birmingham, Alabama | LBF | North Platte, Nebraska |
| BIL | Billings, Montana | LGA | New York (LaGuardia), New York |
| BIS | Bismarck, North Dakota | LIT | Little Rock, Arkansas |
| BNA | Nashville, Tennessee | LND | Lander, Wyoming |
| BOI | Boise, Idaho | MCI | Kansas City, Missouri |
| BOS | Boston, Massachusetts | MDW | Chicago (Midway), Illinois |
| BRO | Brownsville, Texas | MEM | Memphis, Tennessee |
| BTV | Burlington, Vermont | MFR | Medford, Oregon |
| BUF | Buffalo, New York | MIA | Miami, Florida |
| CAE | Columbia, South Carolina | MKE | Milwaukee, Wisconsin |
| CAO | Clayton, New Mexico | MOB | Mobile, Alabama |
| CDC | Cedar City, Utah | MSP | Minneapolis, Minnesota |
| CHS | Charleston, South Carolina | MSY | New Orleans, Louisiana |
| CLE | Cleveland, Ohio | OKC | Oklahoma City, Oklahoma |
| CLT | Charlotte, North Carolina | OMA | Omaha, Nebraska |
| CMH | Columbus, Ohio | ORF | Norfolk, Virginia |
| CPR | Casper, Wyoming | PDX | Portland, Oregon |
| CRW | Charleston, West Virginia | PHL | Philadelphia, Pennsylvania |
| CYS | Cheyenne, Wyoming | PHX | Phoenix, Arizona |
| DAG | Daggett, California | PIH | Pocatello, Idaho |
| DCA | Washington, D.C. | PIT | Pittsburgh, Pennsylvania |
| DDC | Dodge City, Kansas | PVD | Providence, Rhode Island |
| DEN | Denver, Colorado | PWM | Portland, Maine |
| DFW | Dallas-Ft. Worth, Texas | RAP | Rapid City, South Dakota |
| DLH | Duluth, Minnesota | RDU | Raleigh-Durham, North Carolina |
| DRT | Del Rio, Texas | RNO | Reno, Nevada |
| DSM | Des Moines, Iowa | ROW | Roswell, New Mexico |
| DTW | Detroit, Michigan | SAC | Sacramento, California |
| ELP | El Paso, Texas | SAN | San Diego, California |
| ELY | Ely, Nevada | SAT | San Antonio, Texas |
| FAR | Fargo, North Dakota | SAV | Savannah, Georgia |
| FAT | Fresno, California | SDF | Louisville, Kentucky |
| FLG | Flagstaff, Arizona | SEA | Seattle-Tacoma, Washington |
| FSD | Sioux Falls, South Dakota | SFO | San Francisco, California |
| FSM | Fort Smith, Arkansas | SHV | Shreveport, Louisiana |
| GEG | Spokane, Washington | SLC | Salt Lake City, Utah |
| GGW | Glasgow, Montana | SSM | Sault Ste Marie, Michigan |
| GJT | Grand Junction, Colorado | STL | St. Louis, Missouri |
| GTF | Great Falls, Montana | SYR | Syracuse, New York |
| HLN | Helena, Montana | TPA | Tampa, Florida |
| IAH | Houston, Texas | TUL | Tulsa, Oklahoma |
| ICT | Wichita, Kansas | TUS | Tucson, Arizona |

Table 2. Ninety-four stations for which scores are saved in the AFOS-era score archive.

| | | | |
|---|---|---|---|
| ABI | Abilene, Texas | LAX | Los Angeles, California |
| ABQ | Albuquerque, New Mexico | LBB | Lubbock, Texas |
| ALB | Albany, New York | LBF | North Platte, Nebraska |
| ALO | Waterloo, Iowa | LEX | Lexington, Kentucky |
| ATL | Atlanta, Georgia | LGA | New York (LaGuardia), New York |
| *AVP | Scranton, Pennsylvania | LIT | Little Rock, Arkansas |
| BHM | Birmingham, Alabama | MCI | Kansas City, Missouri |
| BKW | Beckley, West Virginia | MEI | Meridian, Mississippi |
| BIS | Bismarck, North Dakota | MEM | Memphis, Tennessee |
| BNA | Nashville, Tennessee | MFR | Medford, Oregon |
| BOI | Boise, Idaho | MIA | Miami, Florida |
| BOS | Boston, Massachusetts | MKE | Milwaukee, Wisconsin |
| BTV | Burlington, Vermont | MOB | Mobile, Alabama |
| BUF | Buffalo, New York | MSN | Madison, Wisconsin |
| CAE | Columbia, South Carolina | MSP | Minneapolis, Minnesota |
| CDC | Cedar City, Utah | MSY | New Orleans, Louisiana |
| CHS | Charleston, South Carolina | OKC | Oklahoma City, Oklahoma |
| CLE | Cleveland, Ohio | OMA | Omaha, Nebraska |
| CLT | Charlotte, North Carolina | ORD | Chicago (O'Hare), Illinois |
| CMH | Columbus, Ohio | ORF | Norfolk, Virginia |
| CON | Concord, New Hampshire | PDX | Portland, Oregon |
| CPR | Casper, Wyoming | PHL | Philadelphia, Pennsylvania |
| CRW | Charleston, West Virginia | PHX | Phoenix, Arizona |
| CYS | Cheyenne, Wyoming | PIH | Pocatello, Idaho |
| DCA | Washington, D.C. | PIT | Pittsburgh, Pennsylvania |
| DEN | Denver, Colorado | PVD | Providence, Rhode Island |
| DFW | Dallas-Ft. Worth, Texas | PWM | Portland, Maine |
| DLH | Duluth, Minnesota | RAP | Rapid City, South Dakota |
| DSM | Des Moines, Iowa | RDU | Raleigh-Durham, North Carolina |
| DTW | Detroit, Michigan | RNO | Reno, Nevada |
| ELP | El Paso, Texas | SAN | San Diego, California |
| ERI | Erie, Pennsylvania | SAT | San Antonio, Texas |
| EWR | Newark, New Jersey | SAV | Savannah, Georgia |
| FAR | Fargo, North Dakota | SBN | South Bend, Indiana |
| FAT | Fresno, California | SDF | Louisville, Kentucky |
| FSD | Sioux Falls, South Dakota | SEA | Seattle-Tacoma, Washington |
| FSM | Fort Smith, Arkansas | SFO | San Francisco, California |
| GEG | Spokane, Washington | SHV | Shreveport, Louisiana |
| GJT | Grand Junction, Colorado | SLC | Salt Lake City, Utah |
| GRR | Grand Rapids, Michigan | SPI | Springfield, Illinois |
| GTF | Great Falls, Montana | STL | St. Louis, Missouri |
| HLN | Helena, Montana | SYR | Syracuse, New York |
| IAH | Houston, Texas | TCC | Tucumcari, New Mexico |
| ICT | Wichita, Kansas | TOP | Topeka, Kansas |
| IND | Indianapolis, Indiana | TPA | Tampa, Florida |
| JAN | Jackson, Mississippi | TUL | Tulsa, Oklahoma |
| LAS | Las Vegas, Nevada | TUS | Tucson, Arizona |

* Atlantic City, New Jersey (ACY) was used in place of Scranton, Pennsylvania for the 1983-84 cool season and 1984 warm season.

Table 3. Summary of changes to the AEV score archive.

| Approximate Date | Type of Change |
|---|---|
| October 1984 | Scranton, Pennsylvania began sending data in place of Atlantic City, New Jersey. |
| October 1984 | 24-h projection from 0000 and 1200 GMT replaced the 30-h projection for wind speed and direction. |
| November 1985 | MOS forecasts of daytime max and nighttime min temperatures replaced forecasts of calendar day max and min temperatures. |
| December 1986 | Change in release time of official aviation terminal forecasts. MOS and local aviation element forecasts of ceiling height, visibility, and wind speed and direction are no longer valid for the same time (except for the 42-h projection of wind speed). |
| April 1988 | Mean square error improvement over climatic normal max and min temperature score added. |

Table 4. Scores for each weather element in the score archive. Approximate release times and projections are also indicated.

| Weather Element | Type of Data | Data ID | Release Time (GMT) | Hours from Release Time | Scores |
|---|---|---|---|---|---|
| Max temp | MOS forecast | 2009 | 0300 | 21, 45 | 20, 21, 30*, 31, 40, 80, 81, 2201, 2202, 2203, 2204 |
| | | | 1500 | 33, 57 | same as above |
| | Local forecast | 2059 | 0900 | 15, 39 | same as above |
| | | | 2100 | 27, 51 | same as above |
| | Climatology | 2069 | 0000 | 24, 48 | 30* |
| | | | 1200 | 36, 60 | 30* |
| Min temp | MOS forecast | 2109 | 0300 | 33, 57 | 20, 21, 30*, 31, 40, 80, 81, 2201, 2202, 2203, 2204 |
| | | | 1500 | 21, 45 | same as above |
| | Local forecast | 2159 | 0900 | 27, 51 | same as above |
| | | | 2100 | 15, 39 | same as above |
| | Climatology | 2169 | 0000 | 36, 60 | 30* |
| | | | 1200 | 24, 48 | 30* |
| PoP | MOS forecast | 6100 | 0300, 1500 | 21, 33, 45 | 10, 11, 12, 50, 90, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313 |
| | Local forecast | 6150 | 0900, 2100 | 15, 27, 39 | same as above |
| | Climatology | 6160 | 0000, 1200 | 24, 36, 48 | 10 |
| | Observation | 6190 | 0000, 1200 | 24, 36, 48 | 90 |

* The score corresponding to the number 30 was not available prior to April 1988.

Table 4. (Continued).

| Weather Element | Type of Data | Data ID | Release Time (GMT) | Hours from Release Time | Scores |
|---|---|---|---|---|---|
| Precip type | MOS forecast | 400X | 0300, 0900 | 15, 27, 39 | 50, 70, 201, 202, 203, 8001, 8002, 8101, 8102 |
| | Local forecast | 405X | 0900, 2100 | 09, 21, 33 | same as above |
| | Observation | 40X0 | 0000, 1200 | 18, 30, 42 | 101, 102, 103 |
| Snow amount | MOS forecast | 4300 | 0300, 1500 | 21 | 50, 70, 201, 202, 203, 204, 8001, 8002, 8003, 8101, 8102, 8103, 8201, 8202, 8203 |
| | Local forecast | 4350 | 0900, 2100 | 15 | same as above |
| | Observation | 4390 | 0000, 1200 | 24 | 101, 102, 103, 104 |
| Cloud amt | MOS forecast | 8000 | 0300, 1500 | 09, 15, 21 | 50, 70, 201, 202, 203, 204 |
| | Local forecast | 8050 | 0900, 2100 | 03, 09, 15 | same as above |
| | Observation | 8090 | 0000, 1200 | 12, 18, 24 | 101, 102, 103, 104 |
| Wind speed | MOS forecast | 500X | 0300, 1500 | 09, 15, 21** | 20, 40, 50, 70, 201, 202, 203, 204, 205, 206 |
| | | | | 39 | 70, 50, 201, 202 |
| | Local forecast | 505X | 0900, 2100 | 03, 09, 15** | 20, 40, 50, 70, 201, 202, 203, 204, 205, 206 |
| | | | | 33 | 70, 50, 201, 202 |
| | Observation | 50XY | 0000, 1200 | 12, 18, 24** | 101, 102, 103, 104, 105, 106 |

For precipitation type, X = 8 if verifying observation is for the verifying hour and X = 9 if observation is for a 2-h window about the verifying hour.

For wind speed, X = 8 if verifying observation is for the verifying hour and X = 9 if observation is for a 6-h window about the verifying hour. Y = 0 if observation verifies the MOS forecast, and Y = 5 if observation verifies the local forecast.

** From October 1983–September 1984, a 27-h projection from release time for the MOS forecasts, a 21-h projection from release time for the local forecasts, and a 30-h projection from release time for the observations was used.

Table 4. (Continued).

| Weather Element | Type of Data | Data ID | Release Time (GMT) | Hours from Release Time | Scores |
|---|---|---|---|---|---|
| Wind direction | MOS forecast | 5500 | 0300, 1500 | 09, 15, 21** | 20, 70, 201, 202, 203, 204, 205, 206, 207, 208 |
| | Local forecast | 5550 | 0900, 2100 | 03, 09, 15** | same as above |
| | Observation | 559Y | 0000, 1200 | 12, 18, 24** | 101, 102, 103, 104, 105, 106, 107, 108 |
| Ceiling height | MOS forecast | 1000 | 0900, 1500 | 09, 12, 15, 21 | 50, 60, 70, 201, 202, 203, 204, 83, 84, 85 |
| | Local forecast | 1050 | 0900, 2100 | 03, 09, 12, 15 | same as above |
| | Persistence | 107Y | 0000, 1200 | 12, 15, 18, 24 | 101, 102, 103, 104 |
| | Observation | 109Y | 0000, 1200 | 12, 15, 18, 24 | same as above |
| Visibility | MOS forecast | 1000 | 0900, 1500 | 09, 12, 15, 21 | 50, 60, 70, 201, 202, 203, 204, 83, 84, 85 |
| | Local forecast | 1050 | 0900, 2100 | 03, 09, 12, 15 | same as above |
| | Persistence | 107Y | 0000, 1200 | 12, 15, 18, 24 | 101, 102, 103, 104 |
| | Observation | 109Y | 0000, 1200 | 12, 15, 18, 24 | same as above |

For wind direction, ceiling height, and visibility, Y = 0 if observation or persistence corresponds to the MOS forecast, and Y = 5 if observation or persistence corresponds to the local forecast.

** From October 1983-September 1984, a 27-h projection from release time for the MOS forecasts, a 21-h projection from release time for the local forecasts, and a 30-h projection from release time for the observations was used.

Table 5. Definitions of categories.

| Weather Element | Category (XX) | Value | Comments |
|---|---|---|---|
| Max/min temp | 01 | 0- 5°F | Used only for the score 22XX. |
| | 02 | 6-10°F | |
| | 03 | 11-15°F | |
| | 04 | >15°F | |
| PoP | 01 | 0.0 | Used for scores 1XX and 3XX. Since local forecasts never have a value of 0.02, scores 102 and 302 always have a value of 9999. in the score archive for the local forecasts. |
| | 02 | 0.02 | |
| | 03 | 0.05 | |
| | 04 | 0.10 | |
| | 05 | 0.20 | |
| | 06 | 0.30 | |
| | 07 | 0.40 | |
| | 08 | 0.50 | |
| | 09 | 0.60 | |
| | 10 | 0.70 | |
| | 11 | 0.80 | |
| | 12 | 0.90 | |
| | 13 | 1.00 | |
| Precip type | 01 | freezing | freezing = freezing drizzle (ZL) and freezing rain (ZR) |
| | 02 | frozen | frozen = ice crystals (IC), ice pellets (IP), ice pellet showers (IPW), snow (S), snow grains (SG), snow pellets (SP), and snow showers (SW) |
| | 03 | liquid | liquid = drizzle (L), rain (R), and rain showers (RW) Three categories used for scores 1XX and 2XX. Scores 80XX and 81XX are calculated only for categories 01 and 02. |

Table 5. (Continued).

| Weather Element | Category (XX) | Value | Comments |
|---|---|---|---|
| Snow amount | 01 | $\leq$ 1 in | Used for the scores 1XX and 2XX. |
| | 02 | 2-3 in | |
| | 03 | 4-5 in | |
| | 04 | $\geq$ 6 in | |
| | 01 | $\geq$ 2 in | Used for scores 80XX, 81XX, and 82XX. |
| | 02 | $\geq$ 4 in | |
| | 03 | $\geq$ 6 in | |
| Cloud amount | 01 | Clear | Category 01 also includes thin scattered, thin broken, thin overcast, and partially obscured. Category 04 also includes obscured. Used for scrores 1XX and 2XX. |
| | 02 | Scattered | |
| | 03 | Broken | |
| | 04 | Overcast | |
| Wind speed | 01 | $\leq$ 12 kt | Six categories are used for the first 3 forecast periods for scores 1XX and 2XX. |
| | 02 | 13-17 kt | |
| | 03 | 18-22 kt | |
| | 04 | 23-27 kt | |
| | 05 | 28-32 kt | |
| | 06 | $\geq$ 33 kt | |
| | 01 | $\leq$ 22 kt | Two categories are used for the 42-h projection for scores 1XX and 2XX. |
| | 02 | > 22 kt | |
| Wind direction | 01 | 340- 20 degrees | Used for scores 1XX and 2XX. |
| | 02 | 30- 60 degrees | |
| | 03 | 70-110 degrees | |
| | 04 | 120-150 degrees | |
| | 05 | 160-200 degrees | |
| | 06 | 210-240 degrees | |
| | 07 | 250-290 degrees | |
| | 08 | 300-330 degrees | |

Table 5. (Continued).

| Weather Element | Category (XX) | Value | Comments |
|---|---|---|---|
| Ceiling height | 01 | 0- 100 ft | Six categories are used for scores 1XX and 2XX. Scores 83, 84, and 85 are for the lowest 2 categories combined. |
| | 02 | 200- 400 ft | |
| | 03 | 500- 900 ft | |
| | 04 | 1000-2900 ft | |
| | 05 | 3000-7500 ft | |
| | 06 | >7500 ft | |
| Visibility | 01 | < 1/2 mi | Six categories are used for scores 1XX and 2XX. Scores 83, 84, and 85 are for the lowest 2 categories combined. |
| | 02 | 1/2 - 7/8 mi | |
| | 03 | 1 - 2 3/4 mi | |
| | 04 | 3 - 4 mi | |
| | 05 | 5 - 6 mi | |
| | 06 | > 6 mi | |

Table 6. Weather elements and corresponding data identification codes in the score archive. The projections archived are also indicated.

| Weather Element | Type of Data | Data ID | Projections | Comments |
|---|---|---|---|---|
| Max temp | MOS forecast | 200X | 24, 36, 48, 60 | X = 8, verifying observation is for calendar day |
| | | | 24, 36, 48, 60 | X = 9, verifying observation is for daytime period |
| | Local forecast | 205X | 24, 36, 48, 60 | X = 8 and 9 same as above |
| | Climatology | 206X | 24, 36, 48, 60 | X = 8 and 9 same as above |
| | Calendar day Max Observation | 2080 | 24, 36, 48, 60 | used to verify local and MOS forecasts |
| | Daytime Max Observation | 2090 | 24, 36, 48, 60 | used to verify local and MOS forecasts |
| Min temp | MOS forecast | 210X | 24, 36, 48, 60 | X = 8, verifying observation is for calendar day |
| | | | 24, 36, 48, 60 | X = 9, verifying observation is for nighttime period |
| | Local forecast | 215X | 24, 36, 48, 60 | X = 8 and 9 same as above |
| | Climatology | 216X | 24, 36, 48, 60 | X = 8 and 9 same as above |
| | Calendar day Min Observation | 2180 | 24, 36, 48, 60 | used to verify local and MOS forecasts |
| | Nighttime Min Observation | 2190 | 24, 36, 48, 60 | used to verify local and MOS forecasts |
| PoP | MOS forecast | 6100 | 24, 36, 48 | |
| | Local forecast | 6150 | 24, 36, 48 | |
| | Climatology | 6160 | 24, 36, 48 | |
| | Observation | 6190 | 24, 36, 48 | 12-h precipitation amount |
| Precip type | MOS forecast | 400X | 18, 30, 42 | X = 8, verifying observation is for verifying hour |
| | | | | X = 9, verifying observation is in a 2-h window |
| | Local forecast | 405X | 18, 30, 42 | X = 8 and 9 same as above |
| | Observation | 40X0 | 18, 30, 42 | X = 8 and 9 same as above |

Table 6. (Continued).

| Weather Element | Type of Data | Data ID | Projections | Comments |
|---|---|---|---|---|
| Snow amount | MOS forecast | 4300 | 24 | |
| | Local forecast | 4350 | 24 | |
| | Observation | 4390 | 24 | 12-h snow amount |
| Cloud amt | MOS forecast | 8000 | 12, 18, 24 | |
| | Local forecast | 8050 | 12, 18, 24 | |
| | Observation | 8090 | 12, 18, 24 | |
| Wind speed | MOS forecast | 500X | 12, 18, 24, 42 | X = 8, verifying observation is for verifying hour<br>X = 9, verifying observation is in a 6-h window |
| | Local forecast | 505X | 12, 18, 24, 42 | X = 8 and 9 same as above |
| | Observation corresponding to MOS forecast | 50X0 | 12, 18, 24, 42 | X = 8 and 9 same as above |
| | Observation corresponding to local forecast | 50X5 | 12, 18, 24, 42 | X = 8 and 9 same as above |
| Wind direction | MOS forecast | 5500 | 12, 18, 24 | verifying observation is for verifying hour |
| | Local forecast | 5550 | 12, 18, 24 | verifying observation is for verifying hour |
| | Observation corresponding to MOS forecast | 5590 | 12, 18, 24 | verifying observation taken from hourly observations after March 1987 |
| | Observation corresponding to local forecast | 5595 | 12, 18, 24 | observation taken from AEV data archive |

Table 6. (Continued).

| Weather Element | Type of Data | Data ID | Projections | Comments |
|---|---|---|---|---|
| Ceiling height | MOS forecast | 1000 | 12, 15, 18, 24 | no forecasts for the 15-h projection |
| | Local forecast | 1050 | 12, 15, 18, 24 | |
| | Persistence | 1070 | 12, 15, 18, 24 | persistence associated with the MOS forecast, taken from hourly observations after March 1987 |
| | Persistence | 1075 | 12, 15, 18, 24 | persistence associated with the local forecast, taken from AEV data archive |
| | Observation | 1090 | 12, 15, 18, 24 | observation associated with the MOS forecast (hourly) |
| | Observation | 1095 | 12, 15, 18, 24 | observation associated with the local forecast (AEV) |
| Visibility | MOS forecast | 1500 | 12, 15, 18, 24 | no forecasts for the 15-h projection |
| | Local forecast | 1550 | 12, 15, 18, 24 | |
| | Persistence | 1570 | 12, 15, 18, 24 | persistence associated with the MOS forecast, taken from hourly observations after March 1987 |
| | Persistence | 1575 | 12, 15, 18, 24 | persistence associated with the local forecast, taken from AEV data archive |
| | Observation | 1590 | 12, 15, 18, 24 | observation associated with the MOS forecast (hourly) |
| | Observation | 1595 | 12, 15, 18, 24 | observation associated with the local forecast (AEV) |

```
//WEVDTMPC JOB (WE20008M1K1014V,TDL-11),'DAGOSTARO',
//    REGION=2000K,TIME=15,NOTIFY=$WE21VD,MSGCLASS=T
//*FORMAT PR,DDNAME=,DEST=GRAMX,CARRIAGE=8#IN
//      EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(100,50))
//WORK2 DD UNIT=SYSDA,SPACE=(CYL,(100,50))
//SYSIN DD DSN=NWS.WE21.VJD.SOURCE(VERFTMPC),DISP=SHR
//       DD *
     %VERFTMPC(861001,870331,1,1,24,36,48,60,FT20F001,TP868700)
//IN    DD DSN=$WE21VD.TMPOOND,DISP=SHR
//INSTA DD DSN=NWS.WE21.VJD.DATA(STAVERF),DISP=SHR,LABEL=(,,,IN)
//SASLIB DD DSN=NWS.WE21.VJD.SASFMT,DISP=SHR
//SCORARCH DD DSN=$WE21VD.ALLSCORS.CL8687,DISP=(NEW,CATLG),
//   UNIT=TSODA,SPACE=(TRK,250)
/*
//
```

Fig. 1. Example of the JCL that executes the max/min temperature and PoP verification module.

The data input is referred to in SAS as LIST input. This is "format-free" input, i.e., the data values do not have to appear in specific columns. They must, however, appear in the correct order and must be separated by at least one blank. This data set must not be line-numbered (must be a NONUM data set).

Three items of information per station are read, up to six stations per record.

Words 1-3:
  Word 1 - 5-digit station WBAN number
  Word 2 - First letter of region in which the station is located
  Word 3 - Station call letters
    (The call letters are not absolutely necessary since they are not actually used in the program at this time.)
Words 4-6 - Repeat of words 1-3 for the next station.
Words 7-9 - Repeat for next station

This sequence is repeated up to 6 times per record.

If any item of information, such as the station call letters, is omitted for any reason, a single period must appear in the position in which the information would normally appear. As above, the period must be separated from its neighboring data values by at least one blank. If a station is omitted from the list completely, all information pertaining to that station must be deleted (not replaced by periods). The omitted station's information may be replaced by any number of blanks, since blanks are ignored in LIST input.

Fig. 2. Format of the station list input data set.

```
//WEVDOVER JOB (WE20008M1K1014V,TDL-11),'DAGOSTARO',
//   REGION=2000K,TIME=2,NOTIFY=$WE21VD,MSGCLASS=T
//*FORMAT PR,DDNAME=,DEST=GRAMX
//     EXEC SAS
//SYSIN DD DSN=NWS.WE21.VJD.SOURCE(SCORARCH),DISP=SHR
//      DD *
        %SCORS(861001,870331,Y,N,Y,DAYNITXN,NA,TP868700)
//FT21F001 DD DSN=OVER,DISP=(NEW,KEEP),UNIT=T6250,
// DCB=(LRECL=860,RECFM=VBS,BLKSIZE=23224),
//  VOL=SER=EXXXXX,LABEL=(7,SL,,OUT)
//INSTA DD DSN=NWS.WE21.VJD.DATA(STAVERF),LABEL=(,,,IN),DISP=SHR
//SASLIB DD DSN=NWS.WE21.VJD.SASFMT,DISP=SHR
//SCORARCH DD DSN=$WE21VD.ALLSCORS.CL8687,DISP=SHR
/*
//
```

Fig. 3. Example of the JCL that executes the score archive program for max/min temperature.

```
//WEVDOVER JOB (WE20008M1K1014V,TDL-11),'DAGOSTARO',
//   REGION=2000K,TIME=30,NOTIFY=$WE21VD,MSGCLASS=T
//*FORMAT PR,DDNAME=,DEST=LOCAL
//*MAIN LINES=(50,C)
//     EXEC SAS
//SYSIN DD DSN=NWS.WE21.VJD.SOURCE(SCORARCH),DISP=SHR
//      DD *
        %SCORS(861001,870331,N,N,N,DAYNITXN,NA,TP868712)
        %SCORS(861001,870331,N,N,N,POP,NA,TP868700)
        %SCORS(861001,870331,N,N,N,POP,NA,TP868712)
        %SCORS(861001,870331,N,N,N,CLD,NA,CD868700)
        %SCORS(861001,870331,N,N,N,CLD,NA,CD868712)
        %SCORS(861001,870331,N,N,N,CIG,LCL,CGL86870)
        %SCORS(861001,870331,N,N,N,CIG,LCL,CGL86872)
        %SCORS(861001,870331,N,N,N,CIG,MOS,CGM86870)
        %SCORS(861001,870331,N,N,N,CIG,MOS,CGM86872)
        %SCORS(861001,870331,N,N,N,VIS,LCL,VSL86870)
        %SCORS(861001,870331,N,N,N,VIS,LCL,VSL86872)
        %SCORS(861001,870331,N,N,N,VIS,MOS,VSM86870)
        %SCORS(861001,870331,N,N,N,VIS,MOS,VSM86872)
        %SCORS(861001,870331,N,N,N,MWSP,LCL,MWL86870)
        %SCORS(861001,870331,N,N,N,MWSP,LCL,MWL86872)
        %SCORS(861001,870331,N,N,N,WSPD,LCL,WSL86870)
        %SCORS(861001,870331,N,N,N,WSPD,LCL,WSL86872)
        %SCORS(861001,870331,N,N,N,WDIR,LCL,WDL86870)
        %SCORS(861001,870331,N,N,N,WDIR,LCL,WDL86872)
        %SCORS(861001,870331,N,N,N,MWSP,MOS,MWM86870)
        %SCORS(861001,870331,N,N,N,MWSP,MOS,MWM86872)
        %SCORS(861001,870331,N,N,N,WSPD,MOS,WSM86870)
        %SCORS(861001,870331,N,N,N,WSPD,MOS,WSM86872)
        %SCORS(861001,870331,N,N,N,WDIR,MOS,WDM86870)
        %SCORS(861001,870331,N,N,N,WDIR,MOS,WDM86872)
        %SCORS(861001,870331,N,N,N,PPTV,NA,PT868700)
        %SCORS(861001,870331,N,N,N,PPTV,NA,PT868712)
        %SCORS(861001,870331,N,N,N,POPT,NA,PW868700)
        %SCORS(861001,870331,N,N,N,POPT,NA,PW868712)
        %SCORS(861001,870331,N,N,N,POSA,NA,SW868700)
        %SCORS(861001,870331,N,Y,N,POSA,NA,SW868712)
//FT21F001 DD DSN=OVER,DISP=(MOD,KEEP),UNIT=T6250,
//  VOL=SER=EXXXXX,LABEL=(7,SL,,OUT)
//SASLIB DD DSN=NWS.WE21.VJD.SASFMT,DISP=SHR
//SCORARCH DD DSN=$WE21VD.ALLSCORS.CL8687,DISP=SHR
/*
//
```

Fig. 4. Example of the JCL that executes the score archive program for all elements.

| Word No. \ Record No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Next NGP Header Records | Multiple Data Records | Dummy Record |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 'OVER' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Forecast Release Time in GMT | 9999 |
| 2 | NSTA | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 to NGP + 8 | Score ID | 9999 |
| 3 | NGP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | KSTA( ) | Forecast Projection | 9999 |
| 4 | NSG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Summary No. | Weather Element and Forecast Source | 9999 |
| 5 | NHDR | NSG WBAN and Group Nos. | NSG Call Letters and Group Labels | NSG Station and Group Names | | | | | KSTA( ) WBAN Nos. of Stations In Summary | NSG Scores and Sample Sizes for Stations and Groups | 9999 |
| 6 | NWDS | | | First 4 Char. | Next 4 Char. | Next 4 Char. | Next 4 Char. | Last 4 Char. | | | |
| 7 | Beginning Date | | | | | | | | | | |
| 8 | Ending Date | | | | | | | | | | |
| 9 | 0 | | | | | | | | 0 | | |
| 10 | 0 | | | | | | | | | | |
| NHDR | | | | | | | | | | | |
| NWDS | | | | | | | | | | | |

Fig. 5. Format of the score archive tapes.